value to farmers and others occupying the low lands nearest the river. From these sections most of the live stock was transferred to high ground, and other movable property placed out of danger. Numerous letters have been received from the recipients of flood warnings, expressing appreciation of the Weather Bureau warnings.

NORTHER IN CALIFORNIA.

Mr. W. H. Hammon, forecast official at San Francisco, reports:

Only one injurious condition prevailed during the month, and that was the severe norther of April 12 and 13, ample warning of which was given on the morning of April 11. High desiccating north winds prevailed on the dates mentioned, which seriously blighted growing crops. However, the warning of these conditions is not generally of great benefit, as it is impossible to protect against them. In some irrigated sections an extra amount of water is run upon the land in advance of such periods, the evaporation of which tends to reduce the amount of injury.

FORECASTS IN OREGON.

Mr. B. S. Pague, local forecast official in charge of the Portland, Oreg., forecast district, reports as follows in regard to the forecasts and warnings issued from that station:

During the month no wind signal orders were issued, there being no storms.

The fishing season has opened. There are some 3,000 persons in fishing boats at the mouth of the Columbia River every day. The knowledge that there are no wind signal orders displayed is as valuable as the orders themselves would be. The cannery men, who employ the fishermen, carefully note the forecasts day by day.

Frost forecasts were issued and verified on several dates, but no benefits have been reported.

Rain forecasts are anxiously looked for, owing to the long absence of good general rains.

The temperature forecasts have been watched with considerable interest, owing to the effect the temperature now has on the snow in the mountains, the consequent melting, and the rise of the rivers and streams.

Special forecast information has been asked for and given quite frequently during the month concerning probable rain and the rise of the Columbia. Many people sow seeds, etc., along the river bottom on information issued from this office. One orchardist reported personally that he has found it most profitable and for the best interests of his orchard not to plow until the weather report states that "summer weather conditions" are present.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month 8 high areas and 7 low areas were sufficiently well defined to be traced on Charts I and II. The accompanying table gives the more important statistics regarding the beginning and advance of these highs and lows. These conditions during the month were remarkable for their definitions, duration, and distance over which it was possible to follow them. The average duration for both was 6.5 days. The average length of path was 3,825 and 3,887 miles for highs and lows, respectively.

HIGHS.

Of the 7 highs all but No. I began on the Pacific Coast and all were traced across the country to the Atlantic Coast. Nos. V and VII disappeared off the north Atlantic Coast and the others near the Florida coast.

LOWS.

Of the lows I and VII were first noted in Arizona, II and III near the north Pacific Coast, and IV and V in Alberta. No. VII was last noted in the St. Lawrence Valley, No. V off the middle Atlantic Coast, and all the rest over or near Newfoundland. As low I passed up the Atlantic Coast, a wind of 48 miles an hour was reported at Block Island, p. m. of 5th. Buffalo reported a 56-mile wind, p. m. of 20th, as low No. IV reached the lower Lake Region. The highest wind of the month, 72 miles an hour, was reported from Block Island, p. m. of 28th, as low VI moved up the Atlantic Coast. Many of the highs, and especially the lows, afforded a fair opportunity to study upper and lower cloud motion at or near their centers. In the case of lows the lower clouds in front almost invariably took the direction of the wind or toward the center. The upper clouds on the other hand, when the low moved almost due south, were moving either due east or toward northeast at right angles to the trajectory. The conclusion was rather strong, especially in the case of low VI, that the cause of motion in no case could be the general drift of the atmosphere either in the lower or in the higher layers. It would seem as though in all cases where there are well defined lows moving nearly south or southeast the motion of lower and upper clouds ought to furnish a criterion as to the motion being due to that of any atmospheric strata.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a.m.	50	106	4, a.m.	39	74	2,370	3.0	790	32.9
II	1, p.m.	47	129	9, p.m.	26	78	3,750	8.0	469	17.9
III	6, p.m.	36	124	12, p.m.	31	81	3,330	6.0	555	23.1
IV	10, a.m.	44	125	18, a.m.	32	79	4,140	8.0	517	21.5
V	13, p.m.	48	127	20, a.m.	44	65	3,360	6.5	517	21.5
VI	16, p.m.	42	126	21, p.m.	31	78	3,390	5.0	678	28.2
VII	20, a.m.	33	119	29, a.m.	48	56	5,220	9.0	580	24.2
VIII	26, a.m.	42	127	2, p.m.*	27	85	5,040	6.5	775	32.3
Total							30,600	52.0	4,881	
Mean of 8 tracks							3,825	6.5	610	25.2
Mean of 52 days									588	24.5
Low areas.										
I	1, a.m.	32	116	6, p.m.	47	57	3,870	5.5	704	29.3
II	4, p.m.	47	126	11, a.m.	37	78	3,390	6.5	522	21.7
III	9, a.m.	50	123	17, a.m.	49	60	4,920	8.0	615	25.6
IV	13, a.m.	55	113	22, a.m.	50	60	4,800	9.0	533	22.2
V	20, a.m.	53	118	25, a.m.	40	69	3,870	5.0	774	32.3
VI	24, p.m.	46	96	30, p.m.	46	58	3,300	6.0	550	22.9
VII	28, a.m.	34	113	3, p.m.*	46	77	3,060	5.5	556	23.2
Total							27,210	45.5	4,254	
Mean of 7 tracks							3,887	6.5	608	25.3
Mean of 45.5 days									598	24.9

*May.

THE WEATHER OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The statistical aspect of the weather of the month is presented in the tables which form the closing part of this REVIEW. Table I in particular contains a variety of details from which the reader may select those most interesting to himself. The numerical values in the tables have been generalized in a number of cases, the results appearing on Charts Nos. III to VIII, inclusive.

PRESSURE AND WIND.

Normal conditions.—The geographic distribution of normal barometric readings at sea level and under local gravity for April is shown by Chart VI of the MONTHLY WEATHER REVIEW for April, 1893.

In April there is usually a decrease of pressure over the United States and Canada, except along the north Pacific

Coast and over Maine and the Canadian Maritime Provinces, where the normal pressure is the same or greater than in March. The most marked decrease of pressure (0.10 inch) occurs in the upper Missouri and Mississippi valleys, on the northeastern slope of the Rocky Mountains, and over Arizona and contiguous portions of the Southwest.

In April southerly winds prevail in the middle and lower Mississippi Valley and the Gulf States; southwesterly on the south Atlantic and Pacific coasts and portions of the Plateau Region west of the Rocky Mountains; northerly and northwesterly winds continue over the northeastern slope of the Rocky Mountains, the Lake Region, New England, and the Middle Atlantic States. The most noticeable change in the direction of the prevailing winds of April as compared with those of March is the advance inland of southerly winds in the Mississippi and Ohio valleys.

The current month.—Pressure was above normal over practically the whole country. In the Great Valley of California and a portion of Arizona, and along portions of the north Atlantic Coast, pressure was slightly below normal.

A comparison of the pressure chart for April, 1898, with the corresponding chart for the preceding month shows a decrease of pressure over the eastern half of the United States, amounting to 0.30 inch on the New England Coast and at Halifax. It will be remembered that in March pressure was 0.30 inch *above* the normal in this region; the fall during April is, therefore, merely a return to normal conditions. There was also a fall in the pressure of April as compared with March over the Rocky Mountain and Plateau regions and the upper Missouri Valley. Pressure increased over Texas, the plains and upper Mississippi Valley, and over western Washington.

TEMPERATURE OF THE AIR.

Normal conditions.—The normal mean temperature of the air in the United States in April varies from about 76° at Key West, 69° at Jacksonville, 69° at New Orleans, 69° at Galveston, 58° at San Diego, to 38° at Eastport, 42° at Burlington, 42° at Buffalo, 46° at Detroit, 38° at Duluth, 37° at St. Vincent, 44° at Havre, 48° at Spokane, and 50° at Seattle, on Puget Sound. The warmest regions, as may be seen from the above figures, are the South Atlantic, and Gulf Coast States, southern Arizona, and the interior valleys of California; the coldest are the Red River Valley of the North and the Lake Region.

The differences between the normal temperatures of March and April are not large at stations on the South Atlantic, Gulf, and Pacific coasts, but at inland points, especially on the plains and in the upper Missouri Valley, the increase in the mean values of April over those of March is quite marked. The advent of spring in the last named region comes, therefore, a little earlier than in the Ohio Valley and elsewhere east of the Mississippi.

In studying the distribution of monthly mean temperatures it will be found very helpful to consult the charts at the end of this REVIEW, especially No. VI, Surface Temperatures, Maximum, Minimum, and Mean. This chart gives a very good idea of the variations of temperature with latitude and longitude, and also of the distribution of normal surface temperatures. Chart VI for any month will differ from a normal chart merely in the displacement or bending of the isotherms northward or southward according as the temperature of the particular locality is above or below the normal for the place and season.

The current month.—It will be recalled that March, 1898, was unseasonably warm over nearly all of the region east of the Rocky Mountains, and that it was colder than usual west of the mountains. These conditions were reversed in the current month. Roughly speaking, temperature was above the normal north of a line drawn diagonally from El Paso, Tex., to Lake Superior, and below the normal south of that line. The region of high temperature for the season (an excess of 3° or more per day) includes Nevada, western Utah, and southern Idaho, Arizona, and the eastern half of California, and southeastern Oregon. The region of abnormally low temperature (a daily deficit of 3° or more) includes the lower Mississippi Valley, Alabama, northwestern Georgia, western North and South Carolina, portions of Virginia, West Virginia, Kentucky, and Tennessee.

The lowest temperature of the month was generally experienced during the passage of low area No. I. This storm was attended by snow in the Ohio Valley and Middle Atlantic States, and freezing temperatures were registered southward to Arkansas, northern Louisiana, Mississippi, Alabama, Georgia, and South Carolina.

The lowest temperature registered at any station was 13° below zero at Kipp, Mont. Temperatures below zero were also registered in the mountain regions of Colorado.

The maximum temperatures of the month were generally registered from the 15th to the 18th, and from the 25th to the end of the month.

Maximum temperatures of 100° and over occurred in the lower Rio Grande Valley, Arizona, and the interior valleys of California. The highest temperature registered with standard instruments was 113° at Parker, a station in Arizona on the Colorado River, some miles north of Yuma.

The distribution of the observed monthly mean temperature of the air is shown by red lines (isotherms) on Chart VI. This chart also shows the maximum and the minimum temperatures, the former by broken and the latter by dotted lines. As will be noticed, these lines have been drawn over the Rocky Mountain Plateau Region, although the temperatures have not been reduced to sea level; the isotherms relate, therefore, to the average surface of the country in the neighborhood of the various observers, and as such must differ greatly from the sea-level isotherms of Chart IV.

The average temperatures of the respective geographic districts, the departures from the normal of the current month and from the general mean since the first of the year, are presented in the table below for convenience of reference:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	42.3	+ 0.9	+11.2	+ 2.8
Middle Atlantic	12	49.2	— 1.5	+ 9.0	+ 2.2
South Atlantic	10	59.3	— 2.7	+ 3.6	+ 0.9
Florida Peninsula	7	69.4	— 1.6	— 0.1	0.0
East Gulf	7	62.3	— 4.2	+ 1.6	+ 0.4
West Gulf	7	64.7	— 2.4	+ 8.0	+ 2.0
Ohio Valley and Tennessee	12	52.1	— 3.8	+ 7.5	+ 1.9
Lower Lake	8	44.2	— 0.5	+14.8	+ 3.7
Upper Lake	9	41.7	+ 1.0	+17.3	+ 4.3
North Dakota	7	42.6	+ 0.9	+25.0	+ 6.2
Upper Mississippi	11	49.9	— 1.3	+14.4	+ 3.6
Missouri Valley	10	50.6	— 1.6	+17.2	+ 4.3
Northern Slope	7	45.4	+ 0.7	+ 9.7	+ 2.4
Middle Slope	6	53.6	— 0.5	+ 8.9	+ 2.2
Southern Slope	5	59.5	— 1.7	+ 9.1	+ 2.3
Southern Plateau	13	61.3	+ 4.3	+ 2.2	+ 0.6
Middle Plateau	9	51.0	+ 3.4	— 4.9	— 1.2
Northern Plateau	11	48.8	+ 2.4	+ 6.3	+ 1.6
North Pacific	9	48.9	+ 0.5	+ 3.5	+ 0.9
Middle Pacific	5	55.6	+ 1.3	— 2.1	— 0.5
South Pacific	4	61.8	+ 3.0	+ 1.1	+ 0.3

In Canada.—Prof. R. F. Stupart says:

The mean temperature for April was above the average in all portions of Canada, from Manitoba to our Atlantic Coast, except in the extreme southwestern portion of Ontario, and over and adjacent to the peninsula between the Georgian Bay and Lake Huron, where it was for the most part slightly below the average. In British Columbia it was average or a little above, while from the Rockies to the western border of Manitoba it was below average. The greatest amount below

average, 5°, was recorded at Swift Current; the next greatest amount below being 4°, at Medicine Hat. The station recording the greatest amount above average was Parry Sound, the excess being 4°.

PRECIPITATION.

Normal conditions.—Heavy precipitation in April (4 to 6 inches) occurs chiefly in the lower Mississippi Valley, Arkansas, eastern Texas, also portions of northern Florida, Georgia, and the coast region of North Carolina. A very narrow fringe of the north Pacific Coast also receives on the average from 4 to 5 inches of rainfall. The regions of moderate precipitation (2 to 4 inches) are much greater in extent than was the case in the preceding month. In addition to the areas then covered, viz, the lower Lake Region, the Ohio Valley, the Middle States, and New England, we may now include the upper Lake Region, the upper Mississippi Valley, the Missouri Valley below Yankton, and the Plains Region generally east of the one hundredth meridian. The normal rainfall of the northern Slope and northern Plateau is also slightly heavier in April than in March. Little or no rain falls over the Southwest, including in that designation western Texas, New Mexico, Arizona, the greater part of Utah, Nevada, and the desert region of southeastern California.

The current month.—On the whole, the current month must be classed as one of deficient rainfall. More than the normal amount of rain fell only in New England and the Middle Atlantic States and over the southern Plateau. The rainfall of the South Atlantic States and upper Mississippi Valley was exactly normal, and the fall of the remaining sixteen districts was below normal. The districts having the greatest deficiencies were south and middle Pacific, northern Plateau, east and west Gulf, and Florida Peninsula.

The drought in California and Florida, referred to in previous REVIEWS, continues unbroken. The rainfall of south-central Georgia, less than 300 miles from one of the drought stricken regions, was, however, the greatest that has been experienced in many months.

The distribution of precipitation was somewhat irregular, as may be seen by an examination of Chart III. In the great wheat and corn regions of the interior the amount averaged from 2 to 4 inches; in some portions of Missouri, Kansas, and Nebraska from 4 to 6 inches.

Averages and departures by districts are summarized for convenience of reference in the following table:

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	4.80	145	+1.50	+2.30
Middle Atlantic	12	3.48	106	+0.20	−2.90
South Atlantic	10	3.38	100	0.00	−6.80
Florida Peninsula	7	1.20	56	−1.00	−6.00
East Gulf	7	2.93	66	−1.50	−7.50
West Gulf	7	2.30	59	−1.60	−2.00
Ohio Valley and Tennessee	12	2.58	65	−1.40	+0.80
Lower Lake	8	1.73	74	−0.60	+1.10
Upper Lake	9	1.37	58	−1.00	+0.70
North Dakota	7	1.47	75	−0.50	−0.70
Upper Mississippi	11	3.04	100	0.00	+3.30
Missouri Valley	10	2.84	93	−0.20	+0.80
Northern Slope	7	1.10	69	−0.50	−0.60
Middle Slope	6	1.89	95	−0.10	+0.50
Southern Slope	6	1.64	80	−0.40	−0.40
Southern Plateau	13	0.73	138	+0.20	−0.90
Middle Plateau	9	0.82	89	−0.10	−2.10
Northern Plateau	11	0.75	56	−0.60	−2.40
North Pacific	9	2.87	67	−1.40	−4.30
Middle Pacific	5	0.83	34	−1.60	−8.50
South Pacific	4	0.08	6	−1.20	−5.70

In Canada.—Professor Stupart says:

In eastern Quebec and throughout the Maritime Provinces precipitation was everywhere in excess of the average amount, and very considerably so in many portions of the latter Provinces. At St. John and Halifax it was exceeded by as much as 3 inches, at Grand Manan by 2.8 inches, Chatham by 2.6 inches, and Charlottetown by 2.1 inches. Father Point records the smallest amount above average, 0.3 inch, and Sydney comes next with 0.5 inch. Over all the large remaining portion of the Dominion the average amount was not reached, if we omit a small section of Assiniboia, and a few scattered localities in British Columbia, chiefly contiguous to the coast line, where the fall was up to or a little above the average amount. The deficiency was decidedly marked over large areas, and was strikingly so in the North Saskatchewan Valley, where no measurable amount occurred; also in the Lake Superior Region, where White River reports no measurable amount, and Port Arthur only 0.1 inch. In Manitoba, also, Brandon reports no rain, and the greatest amount reported from any place in that Province is 1.0 inch, and that from Winnipeg. At many places in Ontario the total precipitation for the month did not reach 1.0 inch, and in western Quebec the total amount recorded was also very small.

SNOWFALL.

The total snowfall for the current month is given in Tables I and II, and its geographic distribution is shown on Chart VIII. The snowfall of the month was rather light in all localities, especially in the mountain regions of the West. The greatest snowfall of the month, 33 inches, was recorded at Stamford, Colo. Ten inches and upward fell in portions of northern New England and the Canadian Maritime Provinces, and at mountain stations in California, Colorado, Montana, Oregon, and Utah.

Snow on ground at end of month.—There was practically no snow on the ground at the end of the month except at a few of the mountain stations in Montana, Colorado, California, Oregon, and Utah. The usual chart of snow on the ground at end of month has, therefore, been omitted.

Snowfall in the mountains.—Section Director Brandenburg, of the Colorado Climate and Crop Service, reports as follows:

The ground has been practically bare below timber line for some time prior to the stormy period which set in near the close of the month. In some parts of the mountain region the storm continued for a week, giving a considerable fall of snow, much of which was soon absorbed by the ground, but as a rule the amount of moisture was less than fell over the plains region. On the high ranges the depth of the snow is much less than a month ago, as might be expected from the advance of the season and the number of very warm days in April. In the following extracts from reports the depths, which are given in inches, are for the ranges or peaks in the vicinity of the different points:

Leadville, 24; Tennessee Pass, 12; Newett 12; Riverside, 30 at timber line, above which the snow is in drifts; St. Elmo, 24; Howard, 36; Coaldale, 45; Rosita, the Sangre de Cristo, has about one-half of its area in old snow, 30 inches deep on average; Winfield, 24, from April 28 to May 5, 40 inches fell; Beulah, none, except in canyons.

Boreas, 12; Farnham Summit, 12; Buffalo Springs, 12; Mountaindale and Hammond, none; Como, 12; Freeland, snow practically gone in Clear Creek County, outside of the main range, except in drifts on northern slope, the main range is apparently well supplied; Yankee, 60 fell in month; Moraine, snow in timber going very fast; Redbuttes, Wyo., 2; Manhattan, old snow all gone; Gleneyre, 4.

Wagon Wheel Gap, 12 on north hill sides, none on southern exposures; Alder, only in gulches and timber; Villa Grove, 10; Jasper, 18; Summitville, 36; Osier, only in drifts.

Alpine Tunnel, 50; Crested Butte, 15; Tolifero, none; Waunita, 8; Ruby, 24; Fulford, 36 above timber line, ground bare where a year ago snow was 3 feet deep.

Clarkson, only on north hillsides and in gulches, streams low; Fraser, a few drifts; Grand Lake, 24; Breckenridge, 30; Kokomo, 34, 5 of which is new; Ashcroft, 36, disappearing rapidly; Crystal, 30 in drifts, gulches, and slides, very little as compared with previous years.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 19. Arizona, 14, 17, 29, 30. California, 2, 18, 29, 30. Colorado, 16, 18, 19, 21, 27, 28, 29, 30. Delaware, 5, 27, 28. Georgia, 4, 22, 23, 26, 27. Idaho, 20, 22, 23, 26, 30. Illinois, 8, 9, 10, 17, 18, 24, 25, 26. Indiana, 9, 10, 12, 14. Iowa, 8, 17, 19, 25, 30. Kansas, 3, 5, 11, 12, 17, 18, 21, 29, 30. Kentucky, 9, 10, 12, 13, 16, 20. Louisiana, 4, 18, 19, 22, 23. Maryland, 5, 11, 24, 25, 28. Michigan, 10, 17, 18, 20. Minnesota, 19, 21, 25, 30. Mississippi, 4, 17, 18, 19, 23, 24. Missouri, 3, 4, 8, 17, 21, 22, 23, 24, 25. Montana, 17, 22, 23, 28.

Nebraska, 12, 17, 23, 30. Nevada, 20, 30. New Jersey, 10, 19, 21. New Mexico, 10, 11, 17, 24, 30. New York, 19, 21, 28. North Carolina, 4, 10, 13, 14, 25, 27. North Dakota, 9, 29. Ohio, 9, 10, 14, 17, 20. Oklahoma, 23, 29, 30. Oregon, 1, 6, 7, 18, 22, 26. Pennsylvania, 20, 26, 27. Rhode Island, 19, 28. South Carolina, 14, 19, 22, 24. South Dakota, 30. Tennessee, 4, 10, 13, 26. Texas, 12, 17, 18, 21, 22, 28, 29. Utah, 19, 29, 30. Virginia, 11, 28. Washington, 7, 22, 26, 30. West Virginia, 10, 20. Wisconsin, 9, 13, 20, 21. Wyoming, 11, 23, 29, 30.

The dates when hail was reported in the greatest number of States were: 30th, 15; 17th, 12; 19th, 11; 10th, 10.

SLEET.

The following are the dates on which sleet fell in the respective States:

California, 30. Connecticut, 19, 28, 29. Delaware, 28. Idaho, 7. Indiana, 5. Iowa, 18. Kansas, 2. Kentucky, 5. Maine, 6, 26, 28. Maryland, 5, 28. Massachusetts, 2, 19, 26, 28, 29. Michigan, 19, 20. Minnesota, 1, 9, 18, 19, 25. Missouri, 1. Montana, 7. New Hampshire, 2, 19, 20, 21, 28, 29. New Jersey, 2, 4, 5, 27, 28. New York, 2, 3, 5, 19, 20, 28. North Dakota, 27, 30. Ohio, 2, 20, 21. Oregon, 6, 7, 9, 26, 30. Pennsylvania, 21, 28, 29. Rhode Island, 28. South Carolina, 22, 29. South Dakota, 30. Tennessee, 4, 5, 14. Washington, 7. Wisconsin, 13, 18, 19.

The dates when sleet was reported in the greatest number of States were: 28th, 10; 19th, 7; 5th, 6; 2d, 6.

ICE AND NAVIGATION.

Interlake navigation opened this season much earlier than usual. The Straits of Mackinac were free from ice on March 28, the earliest date but one during the sixty-three years that records have been kept. The straits again filled with ice with the shifting of the wind, but vessels were able to work their passage through on April 2, the majority taking the north passage as the south channel was filled with solid pack ice until the second week in April. The first division of the grain fleet left Chicago on the afternoon of April 1, and arrived at Buffalo on April 4. Little difficulty was experienced from ice except in passing through the straits, the Lakes being remarkably free from ice for the season of the year. The passage into Green Bay was forced on April 11 by the *Ann Arbor No. 1*, in making Gladstone harbor. The steamers *Lockwood* and *Norfolk* were delayed several days by ice after getting into the bay.

The steamer *City of Paris* arrived at Sault Ste. Marie on April 14 and passed through the canal, opening navigation into Lake Superior on that date. The steamer *W. D. Rees* left Duluth for Washburn on April 11, and experienced considerable difficulty in working through the ice after reaching the bay.

HUMIDITY.

The humidity observations of the Weather Bureau are divided into two series; the first or tridaily series began in 1871 and ended with 1887; the second or twice-daily series is continuous from 1888 to the present time.

The monthly means of the second or present series are based upon observations of the whirled psychrometer at 8 a. m. and 8 p. m., seventy-fifth meridian time, which corresponds to 5 a. m. and 5 p. m., Pacific; 6 a. m. and 6 p. m., Mountain; and 7 a. m. and 7 p. m., Central standard time.

Mean values computed from the first series are naturally not directly comparable with those of the second. In general the means of the first series are lower than those of the second, since they include an observation in the afternoon when the relative humidity of the air is near the minimum of the day. At stations in the western plateau region, however, the converse holds good, the means of the second series being lower than those of the first by amounts ranging from 0 to 10 per cent on the average of the year.

In the present state of knowledge respecting the diurnal variation in the moisture of the air, we are scarcely warranted in combining the two series in a general mean.

The current month.—As will be seen by the detailed statement below the air was relatively drier than usual in the great majority of districts; it will also be noticed that the districts in which the air was relatively moist are in almost all cases the same as those in which an excess of precipitation occurred as would naturally be expected.

The normal for any district can be obtained by adding the departure to the average of the current month when the current humidity is below the normal (—), and subtracting it when it is above (+).

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	77	+ 5	Missouri Valley	62	— 3
Middle Atlantic	65	— 2	Northern Slope	56	— 1
South Atlantic	68	— 4	Middle Slope	56	+ 1
Florida Peninsula	70	— 5	Southern Slope	52	— 1
East Gulf	67	— 5	Southern Plateau	32	+ 2
West Gulf	71	— 1	Middle Plateau	45	+ 1
Ohio Valley and Tennessee	64	0	Northern Plateau	55	— 5
Lower Lake	66	— 4	North Pacific Coast	72	— 7
Upper Lake	70	— 4	Middle Pacific Coast	64	—10
North Dakota	64	— 4	South Pacific Coast	61	— 8
Upper Mississippi Valley	66	+ 1			

In using the table by means of which the amount of moisture in the air is computed from the readings of the wet and dry bulb thermometers, the pressure argument has almost always been neglected, an omission that has little significance except for low temperatures and at high stations, such as Santa Fe, El Paso, Cheyenne, and a few others. The failure to apply a correction for the influence of the prevailing pressure on the psychrometer has the effect of making the monthly means of relative humidity at high-level stations too small by quantities ranging from 5 to 10 per cent. In the application of the monthly averages of the above table, or those of individual stations in Table I, to special inquiries, whether in the departments of biology, climatology, or sanitary science, this fact should be kept in mind. It should also be remembered that the hours at which observations in the Rocky Mountain Plateau Region are made, viz, at 5 or 6 local mean time, morning and afternoon, give approximately the maximum and minimum values for the day; probably the means of such hours approach more nearly the true mean of the month than is the case on the Atlantic seaboard and in the seventy-fifth meridian time belt.

WIND.

High winds, local storms, and tornadoes.—Tornadoes of greater or less violence occurred on four days during the month as follows: On the 4th in Arkansas; 5th, Georgia and South Carolina; 22d, Texas and Georgia; 30th, Nebraska, South Dakota, Iowa, and Indian Territory. High winds (velocities of 50 miles per hour and over) occurred on various dates and in a number of localities, as shown in the table below.

The main facts concerning the tornadoes of the month are given in the chronological list which follows:

4th.—Stuttgart, Ark. (1½ mile northwest of), 1 a. m., local mean time; 2 persons injured; property loss, $5,000; path 300 yards wide, 3 to 4 miles long; moved to the northeast; funnel cloud. (Reported by Dr. H. A. Buerkle, voluntary Observer).

5th.—Friendship, Ga., about 11:30 p. m., central time; 1 person killed, 5 injured; property loss, $1,000; path ¼ mile wide, 2 miles long; moved northeast; funnel cloud. This storm appears to have lost the characteristics of a tornado soon after passing Friendship. When near Ellaville, about 10 miles northeast of Friendship, the wreckage appeared to indicate merely a straight-line gale.

Mr. Samuel P. Saltus, voluntary observer, Gillisonville, S. C., reports in some detail upon a minor tornado that was observed about 8 a. m., central time, three or four miles north of Ridgeland, Hampton County, S. C. The tornado moved to the eastward in a path about 4 miles in length and varying in width from 50 to 300 yards. Several buildings were destroyed, but no person was killed or severely injured. The greatest force of the storm seemed to be exerted at some distance above ground, as evidenced by the breaking off of trees and the unroofing of buildings.

22d.—Camilla, Mitchell County, Ga. (two miles north of), 9 a. m., central time, 2 persons injured; property loss about $1,000; path 75 yards wide, 3 or 4 miles long; moved a little east of north; funnel cloud.

A second tornado cloud was observed 1¼ mile from Abbeville in Wilcox County, Ga., about 80 miles due northeast of Camilla, at 11:30 a. m., central time. No casualties; three buildings destroyed; storm moved northeast through wooded section.

A third tornado cloud, moving parallel to and about 40 miles south of the Mitchell County storm, was said to have been observed in Thomas County. Further details are awaited.

Atlanta, Cook County, Tex., noon, central time, 2 persons killed, 1 injured; property loss about $2,000; path of destruction about 150 feet wide, ¾ mile long; moved northeast; funnel cloud.

30th.—A number of tornadoes were observed on the afternoon of the 30th in eastern Nebraska and northwestern Iowa. Probably the most destructive of all had its origin in Dixon County, Nebr. It crossed the Missouri three miles west of Elkpoint, S. Dak., passing thence northeasterly to Richland, S. Dak., and the Iowa border near Chatsworth in Plymouth County. Its movement after leaving Chatsworth is uncertain. A tornado appeared at Maurice, in Sioux County, however, in the direct course of the Chatsworth storm, at 4:45 p. m. The distance to Maurice from the Iowa border, where the tornado entered the State, is about 30 miles. The tornado entered the State about 3:40 p. m.; it is not improbable, therefore, that the Chatsworth and Maurice tornadoes were one and the same. The following special dispatch from Maurice and other remarks upon the tornadoes of this date are quoted from the April number of the Iowa Weather and Crop Service:

This town (Maurice) was visited by a destructive tornado at 4:45 last evening, but no fatalities resulted. The funnel-shaped cloud approached from the southwest. Its fearful roaring gave the citizens ample warning, and most of them had sought refuge in storm caves or cellars when the storm broke in its fury. In the northwestern part of town the most important structures leveled to the ground and totally destroyed are the following: Sioux City and Northern depot; Saint Paul and Kansas City Grain Company's elevators, valued at about $2,000, insured. Two dwelling houses and their contents were also destroyed.

The storm moved in a northeasterly course, passing through the southern portion of Sioux and diagonally through O'Brien County, expending its force at Hartley and vicinity. In O'Brien County, a few miles south of Sheldon, two children were killed, and numerous homes were wrecked. Heavy damage to buildings resulted in Hartley. The central line of this storm covered a distance of over 80 miles.

There were evidently a small group of tornadoes, moving on parallel lines, some distance apart, within the belt of disturbance. The little town of Carnes was struck about 4:50 p. m., and badly shattered buildings mark the pathway of the destroyer.

While the storm above described was sweeping through the counties of Plymouth, Sioux, and O'Brien, a similar disturbance passed on a parallel line, southwest to northeast, through the northern part of Monona (near Whiting), the southeastern part of Woodbury, across a corner of Ida, and through a portion of Buena Vista County. Much damage was wrought by this branch of the same general storm. A special from Oto to the Sioux City Journal said: "The storm began about 4:45 p. m., with a terrific rain and hail, and at 5:15 the dreaded funnel cloud was seen to be forming about a mile southeast of here, causing much alarm, carrying away small houses and overthrowing those somewhat larger, and moving even the largest buildings in its path."

The following description of the storm in Buena Vista County is furnished by David E. Hadden, voluntary observer at Alta. Mr. Hadden writes:

"A severe windstorm, which assumed some of the characteristics of a tornado, passed through a portion of Maple Valley and Nokomis townships, Buena Vista County, in the late afternoon of April 30, which resulted in considerable damage to barns, sheds, and other farm buildings. The sky was nearly overcast all forenoon, and partly cloudy in the afternoon of the 30th, with a brisk south to southwest wind. About 4:30 p. m. heavy clouds were observed in the southwest, with occasional murmurings of thunder. About 5 p. m. rain began, with some hail. This continued until 5:40 p. m., when rain and wind momentarily ceased, and heavy hail from ¼ to 2 inches in diameter began falling, lasting about five or six minutes. Just at this moment I observed the clouds, which were rather low, about 2 miles south of town, revolving quite rapidly (horizontally), and at intervals the suggestion of a funnel cloud would form about half way from the cloud to the ground, then quickly disperse, and again form and disperse. This was repeated several times, but at no time could the cloud be seen to reach the ground. I remarked to neighbors at the time that in all probability a tornado had just passed south of us. At 5:45 p. m. the wind suddenly ceased, but in a few minutes changed to northeast, then north and brisk northwest, accompanied by a very heavy rain, which continued until about 6:30 p. m.

"No lives were lost, or persons injured. But little electric disturbance was noted. About three-fourths of the hailstones were of the size of large marbles, and the rest were 1 to 2 inches in diameter. The location of débris at each farm proves that the storm was of the tornado type."

There appear to have been two groups of tornadoes having their origin in Dixon and Burt counties, Nebr., respectively. Both groups moved in parallel tracks almost due northeast, finally disappearing in Iowa about 6:30 p. m., after having covered about 115 miles. In all 6 persons were killed and probably 6 or 8 injured.

In addition to the tornadoes observed in Dixon and Burt counties a third tornado was seen at 2:09 p. m., central time, in the northwestern part of Lancaster County, Nebr., near the village of Agnew. Five buildings were destroyed in its course of 8 miles, and 2 persons were injured. The latter had fled to the cellar for safety, but were struck by heavy stones as the building was blown from over their heads. The property loss was $2,000.

A violent storm, having some of the characteristics of a tornado, struck Duncan, Ind. T., at 10:30 p. m., central time. One person was killed and 19 injured. The property loss was about $30,000; path of great destruction, ¾ mile wide and 3 miles long.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Amarillo, Tex.	3	64	w.	Fort Canby, Wash.	8	50	se.
Do.	4	54	n.	Do.	21	52	s.
Do.	21	66	w.	Do.	22	59	s.
Block Island, R. I.	27	50	ne.	Hatteras, N. C.	27	68	n.
Do.	28	72	ne.	Do.	28	76	n.
Do.	29	53	ne.	Huron, S. Dak.	7	60	s.
Buffalo, N. Y.	30	57	sw.	Do.	26	50	s.
Columbia, Mo.	13	60	nw.	Do.	27	53	w.
Denver, Colo.	29	58	sw.	Idaho Falls, Idaho.	26	51	sw.
Dodge City, Kans.	7	50	s.	Memphis, Tenn.	13	50	w.
Eastport, Me.	24	52	e.	Do.	26	54	nw.
El Paso, Tex.	3	51	w.	Oklahoma, Okla.	30	50	s.
Do.	12	52	ne.	Pierre, S. Dak.	27	58	nw.
Do.	21	56	w.	Pueblo, Colo.	3	52	n.
Fort Canby, Wash.	6	52	se.	Sault Ste. Marie, Mich.	19	50	se.
Do.	7	60	se.	Williston, N. Dak.	27	60	n.